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The objective of the project is to explore topologies and techniques to realize microwave filters in a standard silicon process. A wideband differential-mode combline filter with a tapped-line input is presented. High suppression of the common-mode and a small size are two important features of the proposed filter. The filter combines two conventional combline filter connected together through discrete capacitors. The realised sixth-order balanced combline filter has a 3 dB bandwidth of 74% from 0.88 to 1.9 GHz. The common-mode suppression is larger than 29 dB, even up to 5 GHz. Furthermore, the filter core size (0.026 lambda(2)(g)) is substantially smaller than previously reported wideband balanced filters.

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Final Report

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Exploratory Research and Development of Microwave Filters in Silicon Technology

Abstract

The objective of the project is to explore topologies and techniques to realize microwave filters in a standard silicon process. A wideband differential-mode combline filter with a tapped-line input is presented. High suppression of the common-mode and a small size are two important features of the proposed filter. The filter combines two conventional combline filter connected together through discrete capacitors. The realised sixth-order balanced combline filter has a 3 dB bandwidth of 74% from 0.88 to 1.9 GHz. The common-mode suppression is larger than 29 dB, even up to 5 GHz. Furthermore, the filter core size (0.026 lambda(2)(g)) is substantially smaller than previously reported wideband balanced filters.

Summary

Advanced radar systems and military communication systems require a high level of signal filtering, especially under jamming conditions. Microwave filters play a crucial role and traditionally the filters are realized using printed circuit techniques on substrates. There is currently a lack of high-Q filters available in silicon technology. As a result, filters are incorporated off-chip leading to design limitation, lower performance, and bulkier circuit designs. There is a strong trend to realize transceiver front-ends in silicon integrated circuits, which necessitates the integration of the microwave filters in silicon too.

The project explores topologies and techniques to realize high-Q microwave filters in a standard silicon process. An L-band filter and a Ka-band filter and both active and passive topologies are considered.

A wideband differential-mode combline filter with a tapped-line input is presented. High suppression of the common-mode and a small size are two important features of the proposed filter. The filter combines two conventional combline filter connected together through discrete capacitors. The realised sixth-order balanced combline filter has a 3 dB bandwidth of 74% from 0.88 to 1.9 GHz. The common-mode suppression is larger than 29 dB, even up to 5 GHz. Furthermore, the filter core size (0.026 lambda(2)(g)) is substantially smaller than previously reported wideband balanced filters.

Details are provided in:

Wideband balanced combline filter with extended common-mode suppression

Author(s): **Taslimi, A. ; Mouthaan, K.**

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